

Rain-bow.—Burlington, Vt., 6th, during a light fall of snow the flakes were particularly noticeable for their perfect symmetry and while the sun was still above the horizon a beautiful rain-bow was formed in two segments, one in the ESE. and the other in the ENE.

Zodiacal Light.—Cambridge, Mass., regularly looked for at 8 p. m., suspected on the 4th and somewhat visible on the 7th, 10th, 16th; observations on other evenings hindered by moonlight or clouds. New Corydon, Ind., 21st, 22nd, 23rd, 24th, 25th; Monticello, Iowa, 15th; Oregon, Mo., 15th; Waterbury, N. Y., 17th; Brookhaven, N. Y., 26th.

Sun Spots.—The following record of Solar phenomena by Mr. D. P. Todd, Assistant in the Nautical Almanac Office, is communicated by him for publication in this REVIEW:—

DATE— Nov., 1879.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
4th, 8 a. m...	1	1	0	0	0	0	1	1	
4th, 4 p. m...	0	0	0	0	0	0	1	1	
5th, 3 p. m...	0	0	0	0	0	0	0	0	Faculae.
7th, 8 a. m...	4	25	0	0	0	0	4	25	{ Faculae.
7th, 3 p. m...	0	0	0	0	0	0	4	25	
9th, 1 p. m...	0	0	2	10	0	0	2	11	
10th, 8 a. m...	0	4	0	0	0	0	2	11	
11th, 4 p. m...	0	4	1	1	0	0	1	14	
13th, 8 a. m...	0	4	0	0	0	0	1	18	
14th, 4 p. m...	0	0	0	0	0	0	1	4	Spots of considerable size.
16th, 8 a. m...	0	0	0	0	0	0	1	3	{ Broad areas of Faculae.
16th, 10 a. m...	0	0	0	0	0	0	1	3	
17th, 8 a. m...	0	0	0	0	0	0	1	3	
21st, 8 a. m...	0	0	1	3	0	0	0	0	Spots probably disappeared by solar rotation.
26th, 8 a. m...	0	0	0	0	0	0	0	0	Faculae.
27th, 9 a. m...	1	3	0	0	0	0	1	3	Faculae.
29th, 8 a. m...	1	3	0	0	0	0	2	4	Faculae.
30th, 11 a. m...	0	0	0	0	0	0	1	3	

NOTE:—On the 1st, at 5 p. m.; 2nd, 5 p. m.; 22nd, 8 p. m.; 23rd, 9 a. m.; 24th, 8 a. m.; 25th, 4 p. m. the sun was also observed by Mr. Todd, but was entirely free from spots or faculae.

Prof. Hinrichs, Iowa City, Ia., reports, "sunspots large, indicating that the very protracted period with few or no spots is now definitely closed".

Mr. William Dawson, at Spiceland, Ind., observed no spots on the 2nd and 3rd, sky very poor. 4th, one small spot midway between the centre and eastern edge of the sun. 6th, a group of four spots, one large with penumbra close to the southeast margin. 12th, a large group of about 25 spots (definition poor) in the southwest quadrant; ones pot—or rather two very close together—appeared to be five or six thousand miles across; it had a large penumbra. 13th, one group of 25th spots. 16th, one group of three spots close to western edge. 18th, one spot and a considerable number of faculae at the eastern and western edges. 19th, 21st, 24th, no spots. 28th, two spots close to each other near the eastern edge, faculae. 30th, nine spots, one group, about half-way from the centre to southern edge of the sun bearing eastward; one spot quite large with penumbra.

Mr. David Trowbridge, at Waterbury, N. Y., observed the sun on the following dates, but saw no spots, 3rd, 4th, 5th, 20th, 23rd, 25th, 27th, 30th. On the 7th, at 8:30 a. m., one spot near eastern margin of the sun's disk; 8th, 25 spots; 9th, 25 spots, in a large and small group; 10th, 7:30 a. m., three spots visible in one group, and a fourth one very faint; 13th, one large spot; 16th, one spot still visible, but quite faint, and situated near the western margin. The last group has undergone many changes during its visibility.

Mr. F. Hess, of Fort Dodge, Iowa, observed spots as follows: 6th, 1 p. m., one large oblong spot with a partial penumbra, and one small one without penumbra near the southeastern limb of the sun; 7th, 8 a. m. one large round spot surrounded by a penumbra and four smaller ones with white faculae, all very distinct and lying in the southeastern quadrant; 1 p. m. one large and one small spot surrounded by a common penumbra, four others and faculae all in the southeast quadrant; 9th, 10 a. m. one large and ten smaller spots in the southeast quadrant; 14th and 15th, 1 p. m., one large and ten smaller spots in the southwest quadrant; 16th, 3 p. m. only two spots but close together and surrounded by a common penumbra in the southwest quadrant; 28th, 8 a. m. one large faint spot near the sun's lower limb; 29th, 7 a. m., one large spot with penumbra and one small spot in the southeast quadrant; 9 a. m., one large spot with penumbra and two small ones, and faculae in the southeast quadrant; 10th, 10 a. m., three spots were visible, but the weather was too hazy and windy for distinct vision. The sun was examined all other days of the month but no spots were seen.

Observations were made at Fort Whipple, Va., each day during the month but no spots observed.

NOTES AND EXTRACTS.

Meteorological Observations on the Swedish Northeast Passage Expedition.—The *Vega*, in command of Professor Nordenskiöld, was frozen in on September 28th, 1878, in 67° 7' N. and 173° 30' W. From letters dated up to April 1st, 1879, and later, the following abstract is made, (see *Nature*, November 13th, 1879.) The thickness of ice between the *Vega* and shore was as follows: 1878, September 28th, too thin to bear a man; October 3rd, thick enough for the Tchukches natives; December 1st, 56 centimetres or 22.04 inches. 1879,

January 1st, 92 centimetres or 36.22 inches; February 1st, 108 centimetres or 42.52 inches; February 15th, 120 centimetres or 47.24 inches; March 1st, 123 centimetres or 48.42 inches; April 1st, 127 centimetres or 50.00 inches; May 1st, 154 centimetres or 60.63 inches; June 1st, 154 centimetres or 60.63 inches; July 1st, 103 centimetres or 40.55 inches. Open water always existed a short distance to the northward.

The Temperature during the winter was as follows :

MONTH.	MINIMUM.		MAXIMUM.		MEAN.	
	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.
1878, October.....	— 20°.8	— 5°.44	+ 0°.8	33°.44	— 5°.21	22°.62
November.....	— 27°.2	— 16°.96	— 6°.3	20°.66	— 16°.59	2°.14
December.....	— 37°.1	— 34°.78	+ 1°.2	34°.16	— 22°.81	— 9°.06
1879, January.....	— 45°.5	— 40°.90	+ 4°.1	24°.62	— 25°.05	— 13°.09
February.....	— 43°.8	— 46°.84	+ 0°.2	32°.80	— 25°.08	— 13°.15
March.....	— 39°.8	— 39°.64	— 4°.2	24°.44	21°.65	— 6°.97
April.....	— 38°.0	— 36°.40	— 4°.6	23°.72	— 18°.93	— 2°.07
May.....	— 26°.8	— 16°.24	+ 1°.8	35°.24	— 6°.97	19°.45
June.....	— 14°.3	— 6°.26	+ 6°.8	44°.24	— 0°.60	30°.92

The Barometric Pressure was high, 1878, December 22nd, 6 a. m., 782.0 millimetres, or 30.79 inches, and 1879, February 17th, 6 a. m., 788.1 mm. or 31.03 in.; it was lowest 1873, December 31st, 2 a. m., 723.3 mm. or 28.48 in.

The Surface Winds were almost constantly between NW. and NNW., but the lower clouds moved with similar regularity from SE., which latter current, when it sank to the ground, brought heat and comparatively dry air. The natives say that mountain heights exist in the Tchukche Peninsula, and this may explain the *jöhn*, like properties of the SE. wind. The coldest winds come from the SW. and W., or from the Siberian plain.

Snow-fall was not particularly great, but it drifted remarkably during high winds. Snow was precipitated from the stratum of air within a few inches of the ground on clear nights, and was drifted from NW. to SE. over the north coast of Siberia to more southerly regions.

Auroras were at a minimum of frequency and brilliancy, but the faint auroral arches were studied with great success. These remained unaltered in position hour after hour, and day after day they were constantly visible in clear weather. The average height of these arches Nordenskiöld determined to be about .03 of the earth's radius, or about 120 miles, and a very interesting theory is broached by him in this connection.

Tidal observations gave a maximum range of 18 centimetres or 7 inches, while the wind affected the water by nearly 2 metres, or 6 feet.

Aeronautics.—In *Nature*, November 20, 1879, p. 64, Dr. B. W. Richardson describes the successful method of Mr. Fleuss for living under water, and concludes as follows: "In whatever way Mr. Fleuss gets breathing-room under the water, he has, without a doubt, achieved a great practical success. He has learned how to live independently for a long time shut off from all external access of air. He has learned, if I may so say, to become artificially amphibious, and if his plan succeeds, the cumbrous diving-pumps are done away with and the art of diving is vastly simplified.

"Again, if he can live so long on the small reserve which he carries down with him in his dress, he has only to enlarge the dress, to expand it, that is to say, into a submerged vessel, to be able to go anywhere under the sea and do with intelligence what is now left to unintelligent mechanism. What such an intelligent direction might do with torpedoes it is not at all pleasant to contemplate.

"The plan may be used for the purposes of deep-sea exploration, and the suggestion I made respecting my Salutlanders, that they sought for discoveries on the floors of the great oceans, may be so much nearer to accomplishment than the time which I assign to it, that I may happily live to have the return laugh at what was called 'the most visionary of speculative fancies.' It is equally probable that the aeronaut may be able to rise much higher than he has yet done in this dress or in a car specially constructed on a similar plan.

"The apparatus may almost certainly be applied at once to another service very different in kind and on land instead of water. When a man can move about with an air-supply in his pockets, so to speak, he can go into fire as well as water. In a fire-proof non-conducting dress, provided with a Fleuss' breathing apparatus, a fireman could enter a burning house, and without danger of suffocation go wherever the weight of his body could be borne.

"Lastly, in wells charged with foul air, or in mines charged with choke-damp and other poisonous gases, the Fleuss apparatus will, I feel certain, prove of the greatest practical service, and I am happy in being the means of introducing it at length to the notice of my *confrères* in science."

A balloon liberated October 7th, at Waukesha, Wis., fell near Milwaukee, Wis., on October 10th. It had been driven eastward and then westward to its landing place.—[*Nature*, Nov. 20th.

Atmospheric Electricity.—The following extract from *Nature*, November 20, p. 72, is based on an article in the *Journal de Physique*, for October: "For observation of atmospheric electricity M. Mascart uses a Thomson electrometer connected with a vessel having continuous outflow of water. The deflections of the

needle are transmitted every two and a half minutes to a pencil which records them on a sheet of paper. The series of traces forms a curve, not continuous, indeed, but nearly so. This apparatus was put in action at the College of France in the end of February this year, and the curves obtained during the following five months present several interesting features. The potential of the air is shown to be generally positive, with more or less rapid variations. In bad weather the curves become more irregular; rain nearly always produces very great negative deflections. The change of sign appears before the rain comes, and sometimes rain is followed by very high positive indications. There are also some very rare cases of positive rains, and of great negative deflections without apparent rain in the neighborhood. (This predominance of negative electricity in rain clouds M. Mascart regards as an important point in the question of the origin of atmospheric electricity.) Neglecting accidental variations, one is struck by the fact that the electricity is much more uniform at night and more variable by day. The potential is also considerably higher at night than in the day. The maximum seems to occur about 9 or 10 p. m.; the curve descends slowly towards 6 a. m., then more rapidly; reaches a minimum about 3 p. m., and then rises again in a nearly uniform manner. The indications by the curves are confirmed by numerical tables of monthly averages of eight daily observations at three hours interval. The results thus obtained are in contradiction with ideas commonly adopted. M. Mascart remarks that the continuous maximum of positive electricity observed at night may be of an exceptional character, owing to the anomalous season; he also suggests the possibility of previous observations having been vitiated through defective insulation."

Clouds and Cyclones.—Prof. J. K. Laughton, in *Fraser's Magazine*, August, 1879, gives the following summary of the views of Rev. W. C. Ley:—"This simple theory is to some extent in accordance with fact; but to the recent and still continuing investigations of the Rev. W. Clement Ley we owe not only a more comprehensive description of cyclonic weather, but a singularly ingenious interpretation of it.

"It has long been the custom amongst meteorologists to conceive the cyclone as divided into two halves by the line of its advance, named right and left in the same way as the banks of a river, looking, that is, in the direction in which it is travelling. Mr. Ley now proposes another division, that namely, by the diameter drawn at right angles to the line of its advance; and these halves he would call the front and the rear. According to this division, a cyclone is quartered into right and left front, right and left rear; and Mr. Ley believes that he has established the fact that the different types of weather belong not so much to the different winds as to the different quarters of the cyclone. He describes the front as being preceded by a fringe of cirrus and very high cirro-stratus, extending in streaks to a distance of perhaps 100 miles; these, as they advance, curl upwards and outwards, as though kept asunder by electrical repulsion; but as they come over the observer, they are then 'seen to be more or less reticulated, forming a filmy sheet, the structure of which becomes less and less discernible.' In other cases the threads are but faintly marked from the first, and 'the sky seems simply to become gradually overspread with a milky-looking film of whitish cloud matter.' Bit by bit as it advances, this sheet seems to grow downwards, until it is shut out from our view by the interposition of dark masses of lower cloud; the barometer, till then slightly on the rise, begins to fall; the sky becomes covered with nimbus, and rain is more or less general, the right front being the quarter of heaviest precipitation. As the center, or the transverse diameter approaches, the nimbus breaks; on the right side, the blue sky begins to peep through, and with broken showers and shower clouds, cumulus, cirro-stratus, cirrus, and a rising barometer, the cyclone passes away; whilst on the left, the sky is frequently overcast and hazy to the last.

"In explanation of these appearances Mr. Ley considers that, in general terms, the air throughout the front of the cyclone has a slight upward movement, the expansion due to which is of itself enough to account for the heavy rain-fall frequent in that half; the excess in the right front depending perhaps on its geographical position. He considers that a large portion of the air which has so ascended in front, having been whirled round and having its moisture squeezed out of it, is forced downward in the rear, appearing as a northerly wind, cold and dry by reason not of its coming from the north, but of its coming from above. It is from this condensation of vapour and the comparative vacuum so formed in front, this pressure of a descending current in the rear, that Mr. Ley would attribute the onward march of a cyclone, which he conceives as continually dying out, and being continually re-formed in advance."

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